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Estimating the Direct Costs of Pelvic Inflammatory Disease in Adolescents: A Within-System Analysis

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Abstract

We used 2008–09 physician and hospital charges to estimate the direct cost of medical care per case of pelvic inflammatory disease. The estimated average total charge per episode was $3025 (SD $ $4155). The estimated average charge for patients treated in ambulatory (outpatient clinic and emergency department) settings was $7440 dollars lower than for those treated on inpatient units.

BACKGROUND

Pelvic Inflammatory Disease (PID) is a common reproductive health problem affecting approximately 1 million women each year in the United States [1] with significant longitudinal morbidity observed among affected women.[2–4] Economic analyses using adult data have suggested that outpatient treatment is the most cost-effective strategy for PID management; [5] however, few studies have incorporated adolescent-specific cost parameters. In order to develop a strategic approach to adolescent care, additional cost estimates are needed for care settings utilized by adolescent girls. The goal of this study was to estimate the direct costs of PID care and factors that may contribute to higher costs among adolescents and young adults cared for in a large urban university based hospital system.

METHODS

Medical records for patients aged 12–21 years of age who were treated for PID as a primary diagnosis in a large academic hospital center between May 1, 2008 and April 30, 2009, were identified using International Classification of Diseases, Ninth Revision (ICD-9) coding and extraction from two administrative datasets. The first dataset identified patients based on hospital charges generated for the visits. The patients identified in this larger database included codes for pelvic inflammation (614.3) and salpingitis (614.9) as well as non-PID STI (098.0) codes to ensure that all complicated STIs were captured. A single reviewer evaluated medical records to verify PID diagnoses. Within the institution, separate billing

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coders are employed to evaluate medical records for billing. Using a priori inclusion criteria, records that 1) did not have PID or salpingitis as the final diagnosis were removed from the dataset even if it was clear that the patient was charged for PID based on billing data and 2) non-PID STI charges that were misclassified were also excluded to ensure that the best estimates for pediatric PID care could be ascertained. The patients remaining in the dataset were then cross-matched with the physician charges dataset so that the total charges for each visit could be estimated. Even though some patients were cared for in multiple settings (outpatient clinic, emergency department, and/or the inpatient unit), all patients who were ultimately admitted to the hospital were considered inpatients. Within this system, charges for ambulatory visits resulting in a hospital stay are not separated from the inpatient charges. The final dataset included demographic data (race, insurance status, location of care, clinical service, admission status, and the total physician and hospital-related charges for the visit. Data were evaluated using linear regression analyses. Age was evaluated as a potential confounder in regression analyses using the change in estimate approach given potential modifications in the care plan based on adolescent age.

RESULTS

After excluding all of the non-PID STI visits (N=26) and the visits (N=20) with verified alternate diagnoses (e.g. endometriosis with pelvic pain, c-section with pelvic adhesions noted during delivery), 152 PID patients and 172 visits remained in the dataset. The mean age was 17.8 years (SD 2.1 years). The majority was African American (91.3), low income based on Medicaid or uninsured status (93.6%), cared for in an emergency department (ED) setting (69.9%), and had one PID diagnosis visit during study period (98.6%). Only 8.1% sought care in an outpatient department inclusive of adolescent medicine, general pediatrics, internal medicine, and the gynecological service teams. The mean overall charge for PID within the institution was $3025 (SD $4155), mean hospital charges were $2775 (SD $3998), and mean physician billing costs were $327 (SD $454). As seen in table 1 below, the charges for inpatient care were significantly higher than outpatient care for all charge types.

Six of 37 inpatients (16%) were hospitalized on adolescent psychiatry units. The average total charge for care for adolescents with PID who were also being cared for on the psychiatry unit was $13,368 (SD $4939) compared with $8483 (SD $5131) on medical units. The average length of stay (LOS) on a medical unit was 2.4 days (SD 1.6) and on the psychiatry unit was 8 days (SD 3.5), ($p<.001$) Care on the inpatient psych unit was on average $4885 higher than on medical units. (β=$4885; SE β 2277, $p=.04$) Excluding adolescents treated for PID on inpatient psychiatric units (N=6) given additional the costs of psychiatric care and longer length of stay for this small subset of girls, adolescents cared for in ambulatory units (ED/clinic) generated PID charges that were $7440 lower ($\beta$ −$7440, SE β $473; 95% CI: −$ 8356, −$6525) than medical inpatient unit, controlling for age. Patients who were treated in an outpatient clinic had charges that were $703 lower ($\beta$=−703; 95% CI: −298, 1109) than those treated in the emergency department setting, controlling for age.

DISCUSSION

This analysis using hospital charges demonstrates that the estimated direct costs for initial PID treatment are considerably lower in ambulatory settings. These estimates are higher than anticipated based on inflation adjusted comparisons of published data [6–9] and highly variable within a single hospital system. For example, the anticipated total direct costs for outpatient management of PID in 2009 dollars would range between $300–600 using data from multiple sources that includes claims and hospital billing and the standard deviation for outpatient charges in this study were $763. For hospitalized patients, the length of stay has been reduced from almost 5 to 2 days,[8] but the mean inpatient charge was above the upper limit of the range ($5817–$8117) observed for inpatient treatment not involving surgery in 2009 dollars. [6–9] Adjusting for inflation over the last two decades allows for comparison of total cost, however; care must be taken when interpreting the findings because this adjustment does not account for the change in inpatient services over time.

The Centers for Disease Control and Prevention currently does not recommend hospitalization for all adolescent patients, [10] therefore the variability observed between units likely derives from differences in the severity of illness and/or ability to tolerate an outpatient disposition at the time of initial evaluation. Although only the final disposition is reflected here, all patients were seen initially in an ambulatory setting for the initial evaluation. While psychiatric patients also diagnosed with PID appear to have the highest charges of any disposition group, most of these charges clearly derive from psychiatric service-related billing charges. This group, however, represents 16% of the adolescents hospitalized for PID treatment and the findings indicate the vulnerable status of sexually active adolescents with serious mental health disorders.

The findings from this study must be considered in light of several general limitations. This study is a cross-sectional retrospective study utilizing administrative billing data and ICD-9 coding within a single hospital center located in urban America. The severity of presentation and rates of hospitalization may be reflective of the prevalence of STIs and/or hospital policies around management of adolescents with PID. This study also utilized charges instead of claims data that provide information on reimbursed amounts or a cost accounting system. Use of charges may provide an overestimate of actual direct costs because it includes a markup and is subject to pre-negotiated rates for insurance reimbursement. Since these charges are variable based on each insurer, charges allow for more accurate comparisons of costs between units within the same institution. Charges may also be a more reasonable estimate of direct costs due to state regulations that affect hospital billing practices in Maryland. While there is the potential for misclassification, the electronic medical system was reviewed to verify diagnostic data to support a PID diagnosis and charts that were misclassified using the charge-capture system were removed from the data base. This work, however, is limited to the assessment of direct medical costs associated with an initial PID diagnostic visit. Most patients did not return for a clinical follow-up within the academic center for the 72 hour follow-up advised by the Centers for Disease Control and Prevention.[10] While it is possible that care was sought outside of the system, prior research suggests that less than 25% of adolescent patients return for the recommended follow-up visit. [11] Despite the fact that failure to return for care results in cost-savings in terms of

calculating overall PID expenditures; pediatric patients need the follow-up visits for risk reduction and family planning counseling based on studies that have included risk assessments for adolescent girls with PID.[11] Indirect costs (e.g. travel, wait time, loss of wages) are also not reflected in the estimated costs of PID care.

One major finding in this study is that the vast majority of adolescents within this academic setting were seen for care in emergency departments rather than in outpatient clinics inclusive of the general pediatric, adolescent medicine, and gynecology clinics at a higher estimated direct cost for ambulatory care. Utilization of emergency departments likely reflects the absence of available primary care among uninsured patients, referral for additional evaluation by a local healthcare provider outside of the institution, and/or and the hours that adolescents need to seek services for acute reproductive care. Although recent research has demonstrated promising strategies to improve PID care in ED settings, [12, 13] prior research indicates that adolescents often receive suboptimal care in emergency medical departments.[14–16] Efforts to increase utilization of outpatient clinics by adolescents for PID care and to standardize care across units may reduce the within-system costs for PID treatment, while also improving quality of care.[17]

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Table 1

Mean total, physician billing, and hospital costs for patients treated on ambulatory (emergency department(ED) and outpatient (OP)) versus inpatient units.

	Location of Care	N	Mean ($)	Std. Deviation ($)	p
Physician Charges	**Inpatient**	**23**	**774.30**	**956.32**	**<0.001**
	Ambulatory (ED & OP clinics)	**108**	**231.84**	**105.31**	
Hospital Charges	**Inpatient**	**37**	**8793.98**	**5150.40**	**<0.001**
	Ambulatory (ED & OP clinics)	**135**	**1126.00**	**729.96**	
TOTAL COST	**Inpatient**	**37**	**9275.30**	**5355.51**	**<0.001**
	-Medical Unit	*31*	*8483.18*	*5131.92*	
	-Psychiatry Unit	*6*	*13,367.94*	*4949.53*	
	Ambulatory (ED & OP clinics)	**135**	**1311.48**	**763.64**	
	-ED	*121*	*1382.09*	*768.67*	
	-OP clinics	*14*	*701.25*	*330.74*	

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